

CLAIMS:

1. A method for medically treating a patient comprising the steps of:
 - a) using imaging ultrasound to acquire an initial image of a portion of the patient's body; and
 - b) performing, a predetermined non-zero number of times, the steps of:
 - i) using imaging ultrasound to acquire a current image of the patient's body portion;
 - ii) comparing said current image to a previously-acquired imaging ultrasound image;
 - iii) detecting, based on the comparison, whether the body portion has moved since the previously-acquired image was acquired;
 - iv) if motion is not detected, administering a dose of high-intensity focused ultrasound (HIFU) to a point in the body portion; and,
 - v) if motion is detected, characterizing the motion, aiming a HIFU transmitter based on the characterization to track said point and administering said dose to said point.
2. The method of claim 1, wherein at least steps ii) through v) are performed under automatic processor control and without user intervention.
3. The method of claim 1, wherein step v) further comprises the step of aiming the imaging ultrasound to track said point.
4. The method of claim 1, wherein steps i) through v) are performed a plurality of times and the current images are acquired at a rate of at least two current images per second.
5. The method of claim 1 wherein said images are representative of respective three-dimensional volumes and are represented by respective three-dimensional image frames, the method further comprising, before step b), the steps of setting a three-dimensional image frame count to zero and determining and ordering a set of points in the body portion upon which to focus transmission of HIFU, wherein step b) further comprises, for each iteration, the steps of:
 - determining whether the frame count exceeds a predetermined frame count threshold;
 - if the frame count threshold has not been exceeded, incrementing the frame count;
 - and

- if the frame count threshold has been exceeded:
determining whether a next point in the ordered set exists;
if a next point exists, resetting the frame count to zero and using said next point as said point in the body portion in steps iv) and v); and,
if a next point does not exist, halting further performance of steps i) through v).
6. The method of claim 5, wherein aiming the HIFU transmitter to track a point in step v) also aims the imaging ultrasound to track that same point and does not cause the HIFU to change focus.
7. The method of claim 5, wherein, after a predetermined number of points have been HIFU dosed in step v), said previously-acquired imaging ultrasound image in step ii) is the image first acquired in step i) after the frame count threshold was last exceeded.
8. The method of step 1, wherein, for at least one step i) through v) iteration after the first iteration, said previously-acquired imaging ultrasound image in step ii) is the initial image acquired in step a).
9. The method of claim 1, further including, before step b), the step of aiming said HIFU transmitter at said point.
10. The method of claim 1, further including the step of using HIFU to place in the body portion at least one ultrasonically high-contrast marker for use in making the comparison in step ii).
11. An apparatus for medically treating a patient, comprising:
an ultrasonic transceiver for emitting and receiving ultrasound to image a portion of the patient's body;
a frame buffer;
a frame unit for acquiring a succession of image frames from the ultrasonic transceiver based on the received ultrasound and for storing the succession of image frames in the frame buffer, each image frame constituting an acquired set of ultrasonic images representing a 3-D volume;
a processor for comparing image frames in the frame buffer to detect motion of the body portion;
a high-intensity focused ultrasound (HIFU) transmitter operable to focus on a point in the body portion; and

a controller for causing transmission from the HIFU transmitter to track said point if said motion is detected by said processor.

12. The apparatus of claim 11, further including a timer, wherein the processor is configured to alternate, based on expiry of the timer, image frame acquisitions by the frame unit and transmission by the HIFU transmitter so that a transmission follows an image frame acquisition and vice versa.

13. The apparatus of claim 12, further including a counter for counting image frame acquisitions, said processor being configured to halt HIFU transmission to said point when the counter reaches a predetermined count.

14. The apparatus of claim 13, wherein:

said HIFU transmitter is operable to focus on a predetermined set of ordered points in the body portion;

said processor is further configured to determine, based on a current one of the ordered points, whether a next point in the set exists; and

said controller is operable to cause the HIFU transmitter to track said next point if said next point exists and if said processor has detected motion of the body portion.

15. The apparatus of claim 12, wherein the frame unit is configured to acquire image frames at a rate of at least 2 frames per second.

16. The apparatus of claim 11, wherein said controller is further configured to aim the ultrasonic transceiver to track said point if motion is detected by said processor.

17. The apparatus of claim 16, further including a robot arm that is connected to the ultrasonic transceiver and the HIFU transmitter and is operable by said controller.

18. The apparatus of claim 17, wherein the HIFU transmitter is configured with a central hole that contains the ultrasonic transceiver.

19. The apparatus of claim 18, wherein the ultrasonic transceiver is mounted in fixed relative orientation to the HIFU transmitter.

20. The apparatus of claim 11, further including a user-operable input device for defining boundaries of a treatment volume within said body portion, said point residing within said treatment volume, and for defining at least one ultrasonically high-contrast marker for use in said comparing.

21. The apparatus of claim 11, wherein said controller halts HIFU processing when it receives an externally supplied indicator that sufficient dosage has been applied.

22. The apparatus of claim 11, wherein said controller halts HIFU processing when it receives an ultrasound image based indicator that sufficient dosage has been applied.